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THE SOFT PALATE

— IN —

THE DOMESTIC CAT.

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## THE SOFT PALATE IN THE DOMESTIC CAT.

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The following contribution to Comparative Anatomy is offered as a preliminary to a more general inquiry as to the phylogenesis and the function of the uvula of the palate, or the conditions which favored or led to the uvula of the palate, or the conditions which favored or led to the development of the uvula of the soft palate.

The soft palate—as far as the writer's knowledge extends—is a mammalian character. The union of two plates, which are developed in the stomodaeum mesad from the maxillae, divides this portion of the enteron into a dorsal, or respiratory, and a ventral, or alimentary passage. The prolongation of this septum caudad 35-40 mm., without the osseous plate, constitutes the soft palate. (I. II, 776).

Preliminary to determining the phylogenesis of this septum, its morphology and homology must be established. In the *Ornithorhynchus* "The soft palate is thick, broad, and divided posteriorly caudally into three fimbriated lobes" (I. III, 385). In the *Marsupialia* the palate is "sculptured with transverse ridges" (*ibid.*). In the *Noctilio* (Cheiroptera) "The palate is transversely ridged, the hinder edge usually divided by a medial cleft" (*ibid.* 387). In the great ant-eater (*Myrmecophaga jubata*) "The posterior margin of the soft palate terminates by a low angular projection like the rudiment of a uvula, opposite the base of the epiglottis." "The last eight mm. of the canal (total length of nasal passage = 22 mm.) has musculo-membranous walls, and is an enor-





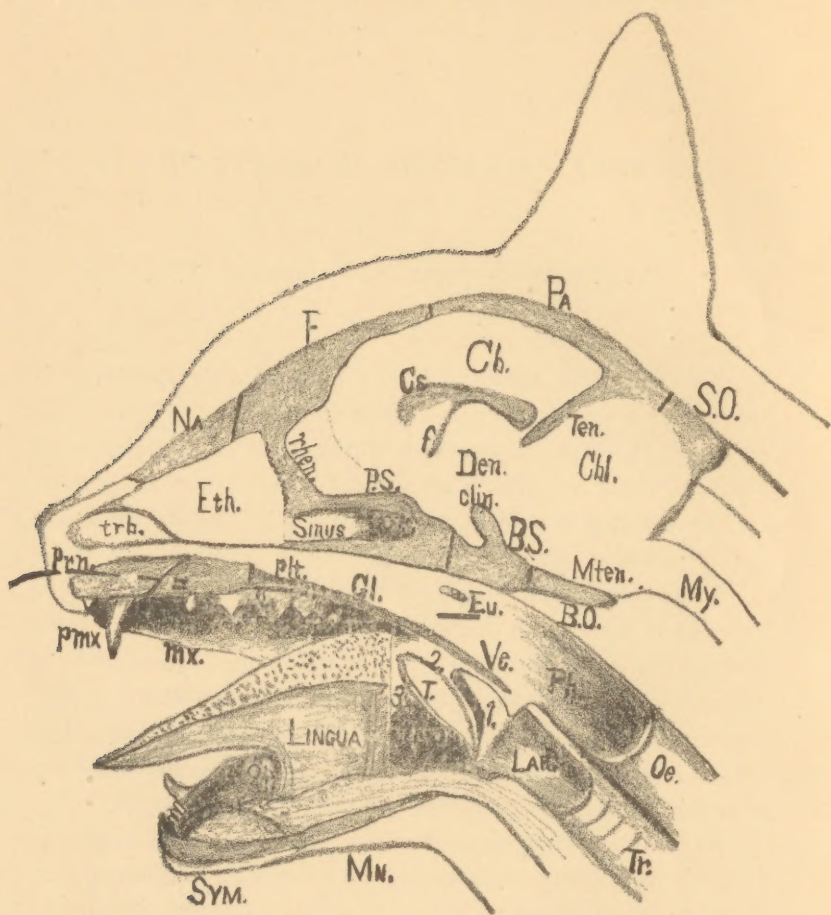


DIAGRAM OF THE HEMISECTED HEAD. — *Storvell.*

#### EXPLANATION OF DIAGRAM.

The diagram is drawn to show the general relation of structures seen in the hemisected head. The — below Eu. show the position of the transected levator muscle, as it appears after the removal of the nasal mucosa. This is probably the best place to begin the dissection of the muscles of the soft palate. The epiglottis (1) is drawn ventrad of the velum, it is more frequently found resting upon the dorsum of the velum.

B. O., Basioccipital bone. B. S., Basi-sphenoid bone. Ch., Cerebrum. Cbl., Cerebellum. Clin., Clinoid process. Cs., Callosum. Den., Diencephal. Eu., Ventral opening of the eustachian tube: the — underneath indicates the position of the levator muscle. f., fornix F., Frontal bone. Gl., Position of the palatine glandular area of the velum Lar., Larynx. Mn., Mandible. Msen., Mesencephal. Mten., Metencephal. Mx., Maxilla. My., Myel. Na., Nasal bone. Oe., Oesophagus Pa, Parietal bone Ph., Pharynx. Plt., Palatine bone. pmx., Praemaxilla. p. n., Post nares. prn., Praenares. P. S., Praesphenoid bone. rhen., Rhinencephal. Sinus, Sphenoidal Sinus. S. O., Supra-occipital bone. Sym., Symphysis menti. T., Tonsil. ten, Osseous plate in tentorium. Ve., Free border of the Velum. 1, Epiglottis. 2, Dorsal mucosal fold, indicating the ventral border of the Pharyngo-staphyle muscle. 3, Ventral mucosal fold, indicating the position of the slender glosso-staphyle muscle.

mously developed homologue of the *palatum molle* in man. The canal of the posterior nares is continued far back beyond the base of the skull, etc." (*Ibid.*, 389.) In the armadillo (*Dasypus 9-cinctus*) the epiglottis projects through the arch of the soft palate, in the middle of which there is a thickened part like a rudimental uvula" (*ibid.*, 390). In the giraffe "The velum palati descends to the interspace between the epiglottis and the large arytenoid cartilages; and there is a uvular process from the middle of the inferior margin" (*ibid.* 394). In the camelidae "The velum palati extends some way down the pharynx, and terminates by a concave border" (*ibid.*, 395). The palate and the pendulous flap from its cephalic portion seem adapted to a special function, viz., to allay the sense of thirst, by being bathed in the water regurgitated from the storage walls of the stomach (395). "The uvula, in the Aye-aye and some other lemuridae, is represented by a median longitudinal fold from the back of the soft palate close to the margin, but does not project so as to divide the fauces into two arches. This form of soft palate begins to appear in the platyrrhines; in the baboons the uvula is thick and short; in the apes it approaches nearer the proportions of that appendage in man" (*Ibid.*, 396).

Having examined this structure in man, two monkeys — *Lago*, *thrix humboldti* (Geoff.) which has no uvula, and *Cercocebus fuliginosus* (Geoff.) in which the uvula is well developed — the horse, the ox, the sheep, the hog, the dog, and the cat, the anatomy of the muscles of the soft palate in the domestic cat is here given in detail.

**Preparation.** — *No. 1.* The arterial system should be injected with the *starch injection mass* (25. 139). After allowing the starch to harden (15 min.) or rather the alcohol to transudate, the head, with one or two cervical vertebrae, should be separated from the trunk: remove the skin, and hemisect the head — the hemisection should be made 5-10 mm. *sinistrad* of the meson in order to insure the integrity

and normal relations of the mesal structures. The mesal view of the hemisection will show the relations of the respiratory and the alimentary passages, and the general divisions of the encephal. After freeing the tongue and the nasal passages of mucus by a light brush notice the extent of the velum, the position of the epiglottis (Fig. 1.), the ventral opening of the eustachian tube in the post nares (Fig. Eu), the amygdaloid area and the included tonsil (Fig. T.) in the lateral wall of the fauces just cephalad of the epiglottis. Slight traction will demonstrate the elastic character of the velum; the relative thickness of the base (cephalic portion) and the free border of the velum should be studied, the former being the glandular area; cf. glandulae palatinae (Fig. Gl.)

No. 2. A second preparation will greatly facilitate the study of the soft palate, indeed is quite indispensable to a correct knowledge of the parts. Dissect the pharynx away from the structures immediately dorsad, then transect the head just caudad of the zygoma. This section divides the ectal tympanic bulla into two nearly equal parts, and passes through the caudal border of the tympanic membrane; it is caudad of the clinoid process (Fig. clin.) and 2 mm. caudad of the ventral border of the osseous plate of the falx. (Fig. ten.) Special precaution in this transection is necessary to insure the integrity of the dorsal extremity of the eustachian tube and the adjacent fossa, this region being the origin of the levator and the tensor muscles.

The caudal view of this section exposes the dorsal wall of the pharynx: with the arthrotome carefully remove the part of the bulla which remains attached to this portion of the head. (Having previously in the hemisected head studied the position and the relations of the levator muscle, it can be seen just how to remove the bulla without disturbing the origin of the levator muscle.) The dissection will be facilitated by removing the sphenoid bone and the clinoid process



with the side cutting nippers (25. 63.) Lay the dorsal wall of the pharynx open by a longitudinal section and by two lateral sections at the level of the cephalic border of the thyroid cartilage. This view exposes the dorsal surface of the velum, the caudal border of which reaches to the cephalic cornua of the thyroid cartilage, and shows the normal relations of the velum and the epiglottis, an arrangement calculated to hermetically seal the pharyngo-oral passage, and to secure an exclusively nasal respiration. (This relation is strikingly similar to that found in the solipeds.) The epiglottis is often found upon the dorsal surface of the velum, the caudal margin of which bears nothing resembling the uvula. (In the diagram the epiglottis I. is shown ventrad of the velum, Ve.)

#### GENERAL DESCRIPTION OF THE VELUM PENDULUM PALATI.

The soft palate is a curtain more or less movable, which serves to continue the post nares caudad and to completely or partially separate the pharyngo-nasal and the pharyngo-oral passages. Its direction is in the same plane as the hard palate, there being strictly no pendulous portion—the ventral surface of the soft palate is somewhat concave—its ontogenesis as well as its morphology show it to be a continuation of the hard palate. It presents for study two surfaces, a ventral or oral and a dorsal or nasal; the ental structures are glands and muscles with their respective vessels, and nerves, and connective tissue. Its free border presents one or more crescentic curves according to the degree of relaxation, or of contraction of the dorsal muscles, especially of the staphyline, q. v. When these muscles are relaxed the outline is convex caudad, when strongly contracted the border presents a compound curve consisting of three elements, the mesal curve deeply concave (concavity caudad), the lateral curves convex (convexity meso-caudad).

The lateral borders of the velum are joined by aponeu-

roses to the pterygoid processes of the palatal bone, and to the mesal plate of the pterygoid bone.

Entad of the mucosa are numerous racemose glands, the glandulae palatinae (Fig. Gl.) which are especially developed in the cephalic half of the velum, where they are aggregated as two amygdaloid bodies. The ducts of these glands open principally upon the ventral surface of the velum — in old cats papillae are often developed. The position of the glands and of their ducts, their enlarged development in the herbivora, and the glutinous character of the secretion indicate that their function is chiefly to aid in deglutition. In the carnivora the richness, softness, and moistness of the food facilitate deglutition, hence the glands are less developed.

The distance (20–24 mm.) to which the pharyngeal constrictors reach cephalad of the caudal border of the velum, its elongation and its longitudinal position render its function in deglutition less active than in man: it is not developed by speech, hence the semi-atrophied condition of its muscles, the caudal portion of the staphyles (q. v.) and their union with other palatine muscles being represented by only a few fibres.

In deglutition the soft palate prevents regurgitation through the nares, and in respiration permits free ingress and egress of air, without communication with the oral cavity.

The innervation is from the trigeminus, the facial, and the glosso-pharyngeal nerves. Diphtheretic paralysis of the palate and uvula (in man), and the association of paralysis of the palate with facial paralysis seem to indicate innervation from the facial nerve. The latter paralysis, according to Erb, follows when the cause is centrad of the geniculate ganglion. What is known as *palato-glossopharyngeal paralysis* points to a common innervation of the palate and the pharyngeal constrictors.

By careful removal of the mucosa of the velum, the glands and the muscles will appear.



## MUSCLES.

The muscles of the soft palate are striated, are paired (five pairs), receive their blood from ramuli of the ectal carotid artery, and are innerved indirectly by the trigeminus and the facial nerves, and directly by the glosso-pharyngeal nerve (the glosso-staphyleus and the pharyngo-staphyleus muscles). These muscles may be classed as intrinsic or peculiar to the palate, *e. g.*, the staphyle muscle, and extrinsic or related to the other structures; the latter class including the remaining eight, whose aponeuroses chiefly form the essential framework of the soft palate.

## M. STAPHYLEUS.

**Synonymy.** — *M. staphyleus* (Gir.), *Staphylinus*, *Palato-staphyleus* (Ch.), *Epistaphylinus*, *Staphylinus medius* (Winslow), *Azygos uvulæ* (Neorgagni).

**Description.** — Upon removing the mucosa from the dorsal surface of the soft palate the staphyle muscle appears as a slender, cylindrical, light-colored muscle, 1 mm.  $\times$  35 mm., extending from the palatal arch caudad to the free border of the soft palate. The mesal border is so closely apposed to its platetrope that the mesal raphé is easily overlooked, and the two staphyles are then taken to be a single mesal muscle, *cf. syn. Azygos*. From the caudal third, slender fascicles are given off laterad to the levator and the tensor muscles, in consequence of which the caudal or free extremity is much reduced and often the muscular fibre is replaced by a thin aponeurosis. The cephalic or origin half is surrounded by the palatal glands.

**Origin.** — The staphyle muscle has its origin from the caudal nasal spine of the palatine bone, and the adjacent aponeurosis just laterad.

**Insertion.** — There seems to be no organ (the uvula being absent) in which this muscle is inserted except the epithelium and the connective tissue which form the free bor-

der of the velum. There are few muscular fibres in the free extremity of the muscle.

**Relations.**—The cephalic half is surrounded by a large amygdaloid gland, the glandulae palatinae. The mesal border is apposed to its platetrope from which it is separated by a thin raphé; the lateral border is in relation with the palatine glands, the levator and the tensor muscles to which it gives filaments to form the aponeurosis of the velum; the dorsal surface is in relation with the palatine glands and the nasal mucosa; the ventral surface with the palatine glands, the palatine aponeurosis and the levator muscle.

**Action.**—The principal action of the muscle is to shorten the velum, thereby drawing the free border cephalad, and dilating the *isthmus of the fauces*. A second action is in conjunction with the levator and the tensor muscles to close the post nares.

**Blood-supply.**—The afferent vessel of this muscle is the descending palatine artery, which ramus of the sphenomaxillary artery bends around the caudal border of the palatal bone, enters the proximal end of the muscle, gives rami to the palatine glands, and continues upon the dorso-lateral border of the muscle to its extremity.

**Innervation.**—The caudal palatine nerve, which has its ectal origin in the lateral border of the sphenomaxillary ganglion just centrad of the palatine foramen, and accompanies the descending palatine artery, innerves this muscle and the palatine glands. The nerve frequently passes through a canal in the ectal plate of the palatine bone, around the lateral border of the pterygoid process about midway between the nasal spine and the pterygoid bone.

#### M. LEVATOR PALATI.

**Synonymy.**—M. Levator palati, Levator palati mollis, Petro-salpingo-staphylinus, Salpingo-staphylinus, Salpingo-staphylinus internus, Pterygo-staphylinus externus, Spheno-sta-

phylinus, Spheno-palatinus, Peristaphylinus internus superior, Petro-staphylinus.

**Description.** — This levator is laterad of the post nares mesad of the tensor muscle ; it consists of two portions, one lateral or nearly vertical, the other horizontal ; the former is somewhat conical, the latter is broad, with its dorsal surface convex and its ventral surface flat. The muscle is best exposed in the hemi-section by removing the nasal mucosa from the dorsal surface of the velum just ventro-caudad of the ventral opening of the eustachian tube (Fig. Eu.). This exposes a band of muscle (Fig. —) 5 mm. wide  $\times$  1 mm. thick, which passes from the lateral wall of the pharynx to the meson. The mesal extremity lies ventrad of the staphyle muscle ; it is also in a line dorsad of the tonsil which appears in the wall of the fauces ventrad of the velum (Fig. T.). It is near the middle of the velum, and marks the caudal boundary of the glandular area, although isolated glands are found caudad of the muscle. The fibres of the thick, caudal portion of the levators meet in the meson, the cephalic portion aids in the formation of the palatine aponeurosis, a few fibres interlacing with the cephalic pharyngeal constrictors. Having exposed the muscle in the hemisection, transect the hemisected head as previously indicated (p. 60) and trace the levator to its origin.

**Origin.** — The levator muscle has its origin in a glistening tendon 8–10 mm. in length from the petrosa of the temporal bone, in the scaphoid fossa at the dorsal end of the eustachian tube. The tendon lies in the fossa ventrad of the cartilaginous tube for nearly half of its length, and then passes obliquely mesad. The muscular fibres begin at the border of the tube where the tendon changes its course, and soon expand as a muscle 5 mm. in breadth. The direction of the expanded muscle is horizontal and mesad.

**Insertion.** — A small portion of the muscular fibres of the two levators unite in the meson ; otherwise the insertion



is the expanded aponeurosis which forms the framework of the velum.

**Relations.** — The origin tendon is in relation with the eustachian tube and the scaphoid fossa, the lateral border being adjacent to the tensor muscle and the pterygoid bone. The dorsal surface of the muscular portion is in relation with the eustachian tube, the nasal mucosa, and the staphyle muscle. The ventral surface is in relation with the dorsal border of the hamular trochlea of the pterygoid bone, the pharyngo-staphyle muscle, the aponeurosis of the tensor muscle, and with the caudal border of the palatine glands. The aponeurotic portion blends with that of the tensor which is ventrad.

**Action.** — This muscle acts in conjunction with the staphyle to raise the free border of the velum and to enlarge the *isthmus of the fauces* for the passage of solids and liquids into the pharynx; at the same time it closes the post nares. It would appear from the structure, position, and action of this muscle that it accomplishes the end usually attributed to the tensor, viz., to open the ventral aperture of the eustachian tube. The following is suggested, while this muscle firmly closes the post nares in deglutition, the sudden and forcible introduction of air into the prenares will dilate the tube and therefore drive the tympanic membrane laterad.

**Blood-supply.** — An arteriole from the ental maxillary artery enters the ventral border of the muscle near its origin.

**Innervation.** — The levator is innervated by a slender filament from the vidian nerve, given off just caudad of the cephalic vidian foramen. This filament may be considered as a separate nerve from the spheno-palatine or Meckle's ganglion, which is included within the sheath of the vidian nerve.

#### M. TENSOR PALATI.

**Synonymy.** — M. Tensor palati, Circumflexus, Circumflexus palati molis, Peristaphylinus externus seu inferior,

Spheno-salpingo-staphylinus, Staphylinus externus, M. tubae novae, Palato-salpingeus, Pterygo-staphylinus, Petro-salpingo-staphylinus, Spheno-ptyerygo-palatinus, Salpingo-staphylinus.

**Description.**—The tensor is a muscle with tendinous extremities. It lies dorso laterad of the levator, between the ental pterygoid and the levator muscles, and is exposed by the removal of the latter and the eustachian tube. The outline of the muscular part is irregularly quadrangular. The maximum thickness is about one mm., and maximum breadth about five mm. The caudal or petrosal end is a bright, glistening tendon; the dorsal border is chiefly muscular, is longer than the ventral, and extends from the dorsal end of the eustachian tube to the base or dorsal end of the pterygoid trochlea; the muscular fibres have a general convergence toward the ventral border of the trochlea, where they unite in a broad (five mm.) aponeurosis which bends around the ventral border of the trochlea and expands over the velum ventrad of the levator, but ultimately blending with the same.

**Origin.**—Is by a tendon from the petrosa of the temporal bone at the dorsal end of the scaphoid fossa, laterad of the origin of the eustachian tube, and from the fossa to the base of the pterygoid trochlea, 18–20 mm.

**Insertion.**—Is by the broad aponeurosis, which forms the framework of the velum.

**Relations.**—The origin tendon is in relation with the ectal tympanic bulla, with the origin tendon of the levator muscle, with the eustachian tube, and scaphoid fossa. The muscular portion is in relation by its dorsal border with the scaphoid fossa; by its lateral surface with the internal pterygoid muscle, which muscle holds the tendon of the tensor in place around the pterygoid trochlea; by its mesal surface with the eustachian tube, the levator muscle, and the pterygoid trochlea. The aponeurosis after crossing the pterygoid trochlea spreads out in the velum.

**Action.**—This muscle is primarily a tensor of the soft palate; secondarily it acts as a levator when the velum is depressed, as in ordinary respiration; it acts as a depressor when the velum closes the post nares in deglutition. During contraction, by reason of the fascia which connects it with the lateral border of the eustachian tube it may act as a dilator of the tube. Cf. action of the Levator palati.

**Blood-supply.**—A small arteriole is given off from the ental maxillary artery about ten mm. peripherad of the dental artery, and just centrad of the arterial rete, which is found in the region of the foramen lacerum anterius. The arteriole lies ventrad of the foramen, and continues caudad close to the pterygoid bone to the origin of the tensor muscle, the lateral surface of which it enters about three mm. peripherad of the caudal extremity of the origin tendon.

**Innervation.**—This muscle receives a slender filament from the otic ganglion, or from the petrosal nerve in the scaphoid fossa.

#### M. PHARYNGO-STAPHYLEUS.

**Synonymy.**—M. Pharyngo-staphyleus, Pharyngo-staphylinus, Staphylinopharyngeus, Thyropharyngo-staphylinus, Palatopharyngeus.

**Description.**—In the hemisected head just cephalad of the caudal border of the velum in the lateral wall of the fauces is seen an amygdaloid area, circumscribed by two folds of the mucosa, which folds, by their confluence caudad, form a transverse fold, which crosses the meson near the base of the epiglottis. This area is sometimes triangular in outline, having its base upon the tongue, and apex dorsad. Within this area is lodged the tonsil (Fig. T.). The folds in the mucosa correspond to two muscles which form the so-called *pillars of the fauces*. By removing the mucosa from the ventral surface of the soft palate and from the adjacent fauces, and by applying slight traction to the mesal border of



the hemisected velum, a thin fan-shaped muscle will be exposed, having its base upon the dorsal margin of the thyroid cartilage, and its broadly expanded margin cephalad in the velum and the pharyngeal wall. This is the Pharyngo-staphyleus muscle and is the caudal pillar of the fauces. (Fig. 2.) The general direction of its fascicles is cephalad and cephalo-mesad. Between its origin and the tonsil where the muscle is mesad of the pharyngeal constrictor, the outline is tolerably well defined and is about five mm. in breadth, but peripherad of the tonsil (at which point the muscle is about ten mm. wide) the broadly diverging fascicles lose the appearance of a muscle and ultimately can be recognized only when identified by their microscopic structure.

**Origin.**—From the dorsal margin and cornu of the thyroid cartilage mesad of the M. stylo-pharyngeus along a line 3–5 mm. This muscle is just entad of the pharyngeal mucosa and laterad of the tonsil, between the tonsil and the pharyngeal constrictors. The general direction of the diverging fibres is cephalad.

**Insertion.**—Cephalad of the tonsil the larger and dorsal portion (this is caudal at the origin) bends mesad and unites with its platetrope in the meson. The remaining fibres cephalad of the tonsil are lost in the broad aponeurosis which lies dorsad of the palatine glands in the cephalic 15–20 mm. of the velum.

**Relations.**—By its lateral surface the central part is related with the pharyngeal constrictors, the corresponding dorsal surface of the terminal portion is in relation with the aponeurosis of the tensor and the levator muscles; the mesal and the corresponding ventral surfaces are opposed to the oral mucosa, the tonsil and the palatine glands.

**Action.**—In deglutition this muscle elevates the larynx and the pharynx, and draws them cephalad; after the bolus has passed caudad of the velum the two pharyngo-staphyle muscles constrict the fauces and prevent the return of the

bolus into the oral cavity; at the same time the levator and the tensor muscles raise the velum and close the post nares. The constrictor behind the bolus forces it into the pharynx.

**Blood-supply.** — From ramuli of the descending palatine artery.

**Innervation.** — This muscle is innerved by filaments from the sphenopalatine ganglion, and by the palatine branch of the glosso-pharyngeal nerve.

#### M. GLOSSO-STAPHYLEUS.

**Synonymy.** — M. Glosso-staphyleus, Glosso-staphylinus, Glosso-palatinus, Palato-glossus, Constrictor Isthmii Faucium.

**Description.** — The mucosal fold which bounds the ventral border of the amygdaloid area corresponds with the M. glosso-staphyleus (Fig. 3.), which muscle is exposed by removing the mucosa and the tonsillar capsule. The glosso-staphyle is a bright red, slender muscle less than 1 mm. in breadth and about 15 mm. long. It is the cephalic pillar of the fauces. These two pairs of muscles, viz., the pharyngo-staphyles and the glosso-staphyles, are the constrictors of the fauces, and act together; they form the lateral borders of the so-called *Isthmus of the fauces*, a passage for the ingress of aliment to the pharynx.

**Origin.** — It has its origin in the ental fascia of the styloglossal muscle near the ventral border of the cephalic thyroid cornu. Its course is dorso-cephalad, and ventrad of the tonsil.

**Insertion.** — The muscle fibres are lost in the aponeurosis of the velum near the caudal border of the glandular area.

**Relations.** — By its origin fibres it is in contact with the styloglossal muscle; by its lateral surface with the pharyngeal constrictors. The aponeurosis seems to lie ventrad of the muscles previously described; its mesal surface is covered by the oral mucosa.

**Blood-supply and Innervation.** — The same as the glosso-staphyle muscle. q. v.

**Structures in a Vertical Section of the Velum —**

The following is the relative position of the structures in the velum from the dorsal surface to the ventral. 1. Nasal mucosa. 2. The staphyle muscle. 3. The levator palati. 4. The aponeurosis of the pharyngo-staphyle. 5. The aponeurosis of the tensor (the aponeuroses of the last two interlace, the order seems to interchange). 6. The glosso-staphyle. 7. The palatine glands: these glands are distributed throughout the velum between the various aponeuroses, but the large racemose glands seem to predominate next to the lining mucosa. 8. Oral mucosa.

**SUMMARY.**

This contribution to Comparative Anatomy is preliminary to the study of the phylogensis of the uvula of the soft palate. The homology of the palate in the domestic cat with that found in man is marked, but the cat has no uvula.

**Preparation** — The arterial system should be injected with the *starch injection mass*. Two preparations and exposures are desirable, a hemisected and a transected head. From the hemisection can be seen, to best advantage, the general relations of the respiratory and the alimentary passages, the eustachian tube, tonsil, epiglottis, etc.; and in detail the muscular portion of the levator, the pharyngo-staphyle and the glosso-staphyle muscles: from the transection can be shown the general extent of the velum and its function in closing the passage from the oral to the pharyngeal cavity, thereby insuring an exclusively nasal respiration; in detail can be demonstrated the origin of the levator and of the tensor muscles, and the intrinsic structure of the velum. In the hemisection the removal of the mucosa exposes the muscle; in the transection the removal of the tympanic bulla, the presphenoid bone, and the dorsal wall of the pharynx are preliminary to the study of the muscles.

**General Description of the Soft Palate.**—This is a



prolongation of the hard palate without the osseous plate: it presents for study two surfaces, the caudal free border, and ental structures, viz., muscles, glands, connective tissue, vessels, and nerves; its function is twofold, in respiration to close the communication between the pharyngo-oral and the pharyngo nasal passages, in deglutition to prevent regurgitation through the nares and by the constriction of the fauces to force the bolus into the pharynx.

#### MUSCLES.

The palatine muscles are striated, paired, receive blood-supply from the ectal carotid artery and are innervated by the Trigemini, the Facial and the Glosso-pharyngeal nerves.

**M. Staphyleus.**—The only intrinsic muscle, slender, 1 mm.  $\times$  35 mm., adjacent to meson. Examine in transected head.

1. *Origin*, from the caudal nasal spine and adjacent aponeurosis.
2. *Insertion*, in aponeurosis and free border of velum.
3. *Relation*, with platetrope, palatine glands, levator and tensor muscles, and nasal mucosa.
4. *Action*, to shorten the velum and to close the post-nares.
5. *Blood-supply*, arterioles from the descending palatine artery.
6. *Innervation*, by the caudal palatine nerve from the sphenopalatine ganglion.

**M. Levator Palati.**—Consists of a vertical and a horizontal part, should be first studied in the hemisection, then traced to origin in the transection.

1. *Origin*, by the tendon from petrosa of the temporal bone and by aponeurosis from the scaphoid fossa.
2. *Insertion*, with its platetrope in the meson, and by the palatine aponeurosis.
3. *Relations*, with the eustachian tube, the scaphoid

fossa, the pterygoid trochlea, the tensor, staphyle, pharyngo-staphyle and glosso-staphyle muscles, the palatine aponeuroses and nasal mucosa.

4. *Action*, to raise the velum and close the post nares.

5. *Blood-supply*, by an arteriole from the ental maxillary artery.

6. *Innervation*, a slender filament of the vidian nerve, or indirectly by the sphenopalatine ganglion.

**M. Tensor Palati.** — Exposed by removal of the levator muscle and the eustachian tube, should be studied in the transected head, presents a muscular and an aponeurotic portion.

1. *Origin*, by tendon from the petrosa of the temporal bone, just laterad of the levator, and from the scaphoid fossa.

2. *Insertion*, in the palatine aponeuroses.

3. *Relations*, with the ental pterygoid and the levator muscles, the eustachian tube, the scaphoid fossa of the pterygoid bone, the pterygoid trochlea, and the palatine aponeuroses.

4. *Action*, primarily to render the velum tense, secondarily to elevate and to depress the velum.

5. *Blood-supply*, an arteriole from the ental maxillary artery.

6. *Innervation*, branch of the petrosal nerve from the otic ganglion.

**M. Pharyngo-staphyleus.** — Should be examined in the hemisection by removing the mucosa of the fauces; the ventral border is indicated by the fold dorsad of the tonsil. This muscle and its platetrope form the *caudal pillars of the fauces*.

1. *Origin*, from the dorsal margin and cornu of the thyroid cartilage.

2. *Insertion*, with its platetrope and in the palatine aponeuroses.

3. *Relations*, with the pharyngeal constrictors, the ten-

sor and the levator muscles, the palatine glands and the oral mucosa.

4. *Action*, in deglutition the tensor holds the velum tense, the constrictors close the *Isthmus of the Fauces* and prevent the return of the food into the oral cavity.

5. *Blood-supply*, from the descending palatine artery.

6. *Innervation*, from the sphenopalatine ganglion and the palatine branch of the glosso-pharyngeal nerve.

**M. Glosso-staphyleus.** — Should be studied in the hemisection; it is exposed by removing the mucosa from the fold ventrad of the tonsil. This and its platetrope are the *cephalic pillars of the fauces*.

1. *Origin*, from the ental fascia of the stylo-glossal muscle.

2. *Insertion*, in the palatine aponeurosis near the caudal border of the palatine glands.

3. *Relations*, with the stylo-glossal and pharyngeal constrictor muscles, the palatine aponeurosis and oral mucosa.

4. *Action*, the glosso-staphyles and pharyngo-staphyles constrict the *Isthmus of the Fauces* in deglutition.

5. *Blood-supply and Innervation*, same as the Pharyngo-staphyleus.

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